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US 5350432 A
EP 0827710 A2
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(54) Abstract Title
Cyclone dust collecting apparatus with removable dust receptacle

(57) A cyclone dust collecting apparatus includes a cyclone body 20 mounted on a telescopic extension pipe 3 of a vacuum cleaner, a cyclone cover 30 and a dust receptacle 40. The cyclone cover 30 is generally cylindrical, having an open end, a closed end and, and a through-hole formed in a circumferential wall of the cylinder. Dirt separated by the cyclone passes through the hole and into a hooded portion of the cover that forms a flow path 35, to hooded portion of the dust receptacle 45 and into the cylindrical dust container 41. The dust receptacle 40 is removably coupled to the cyclone cover 30. The based of the dust container 41 is supported by a fixing member 51 that is mounted to the telescopic pipe of the vacuum cleaner. The fixing member 51 has protrusion 55 that is inserted into a recess 47 in the collecting body 41. A spring 55b resiliently supports the protrusion pin 55a so that the dust receptacle is pushed towards the cyclone cover during use, but may be easily detached for emptying.

The cyclone dust collecting apparatus has a consistently high dust collecting efficiency, regardless of the cleaning position of the vacuum cleaner, and prevents damage to the grille 22 and contamination of the environment when the dust receptacle is emptied.

FIG.2

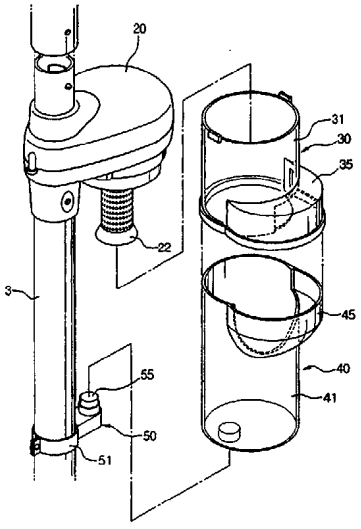

FIG.3

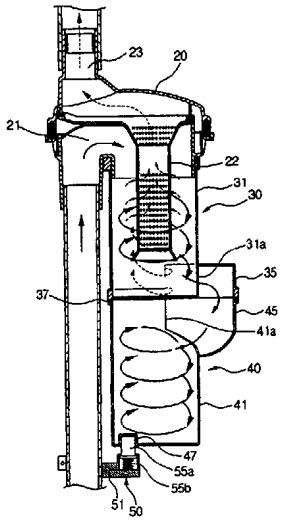

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FIG. 1

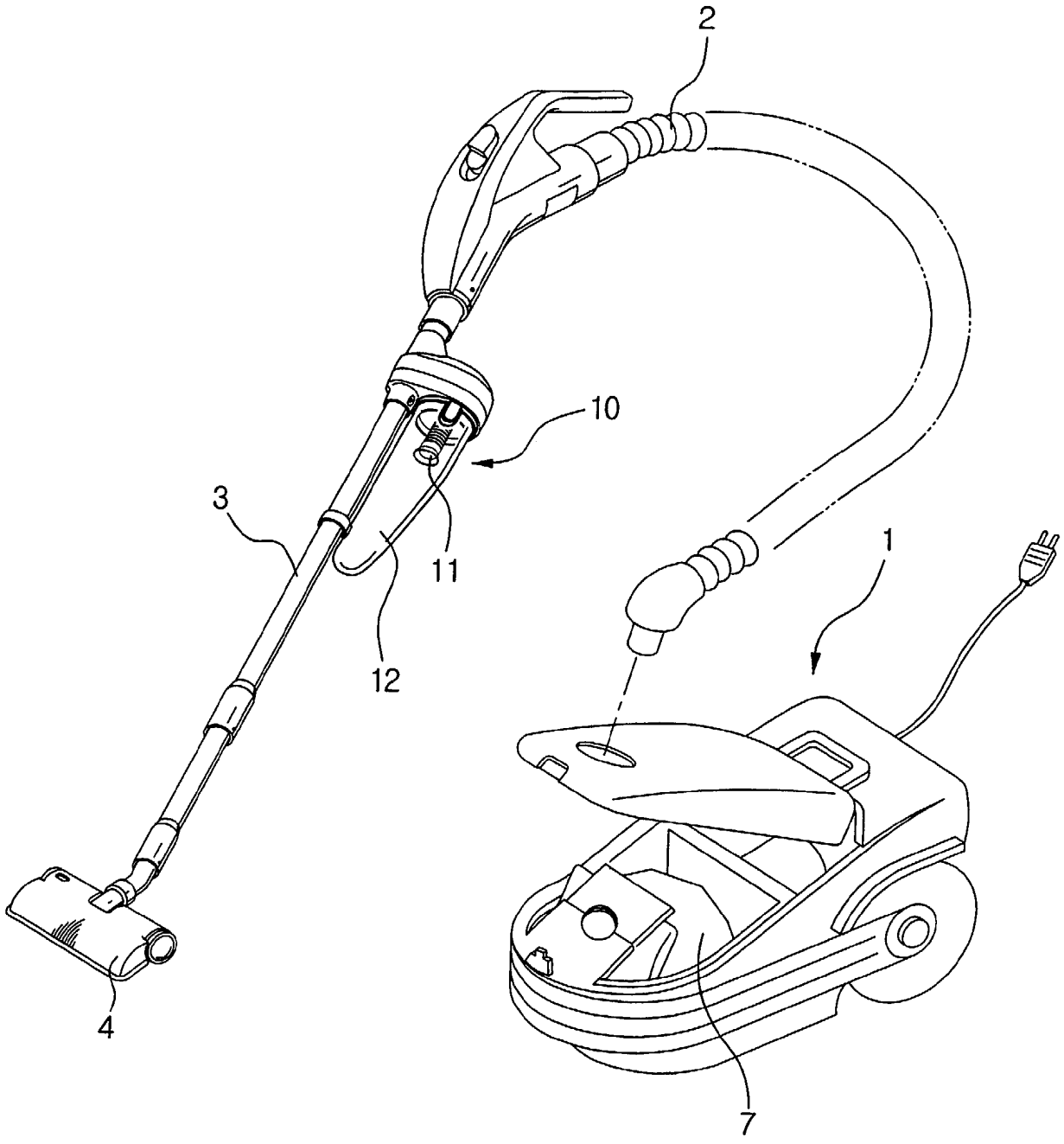


FIG.2

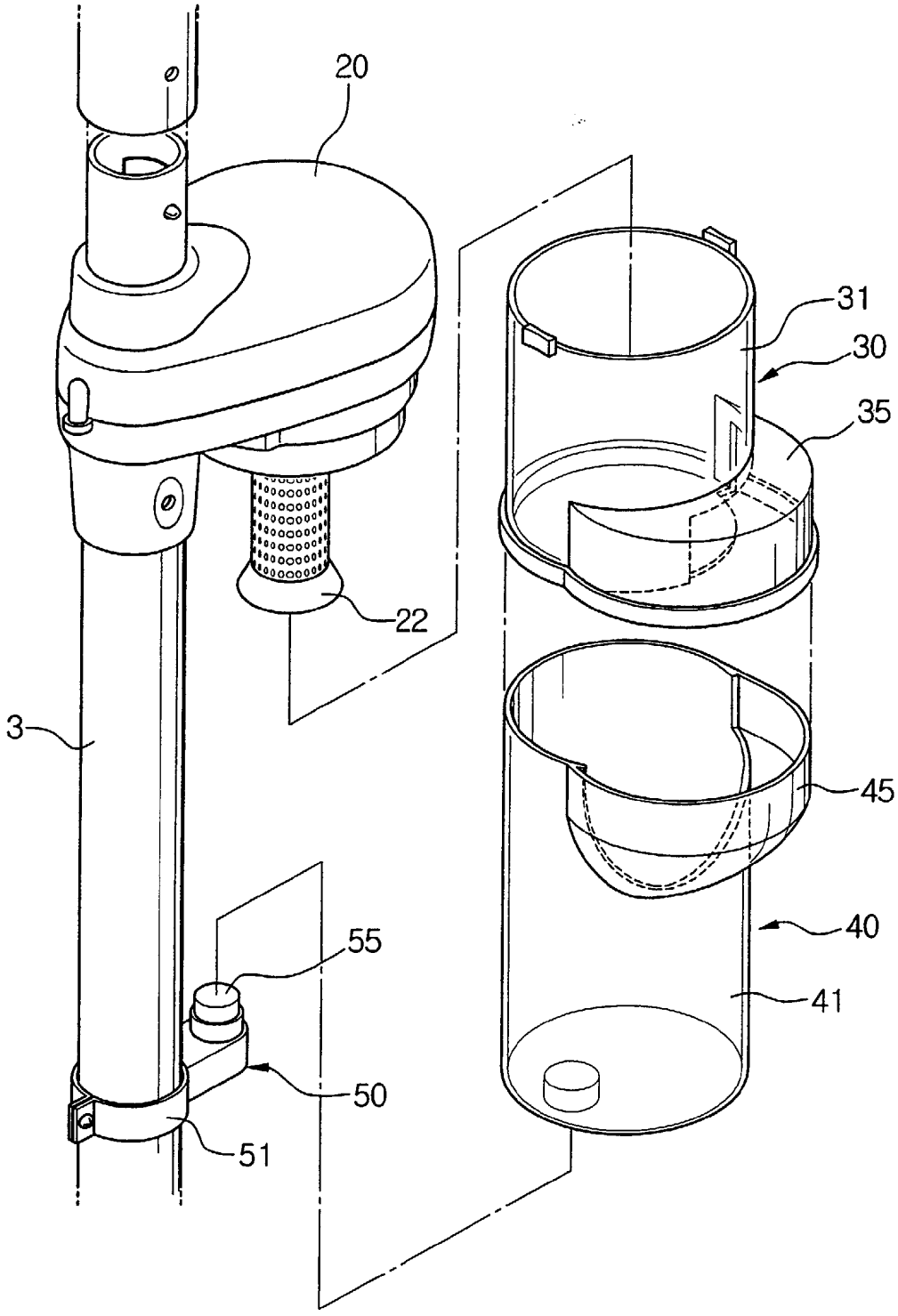


FIG.3

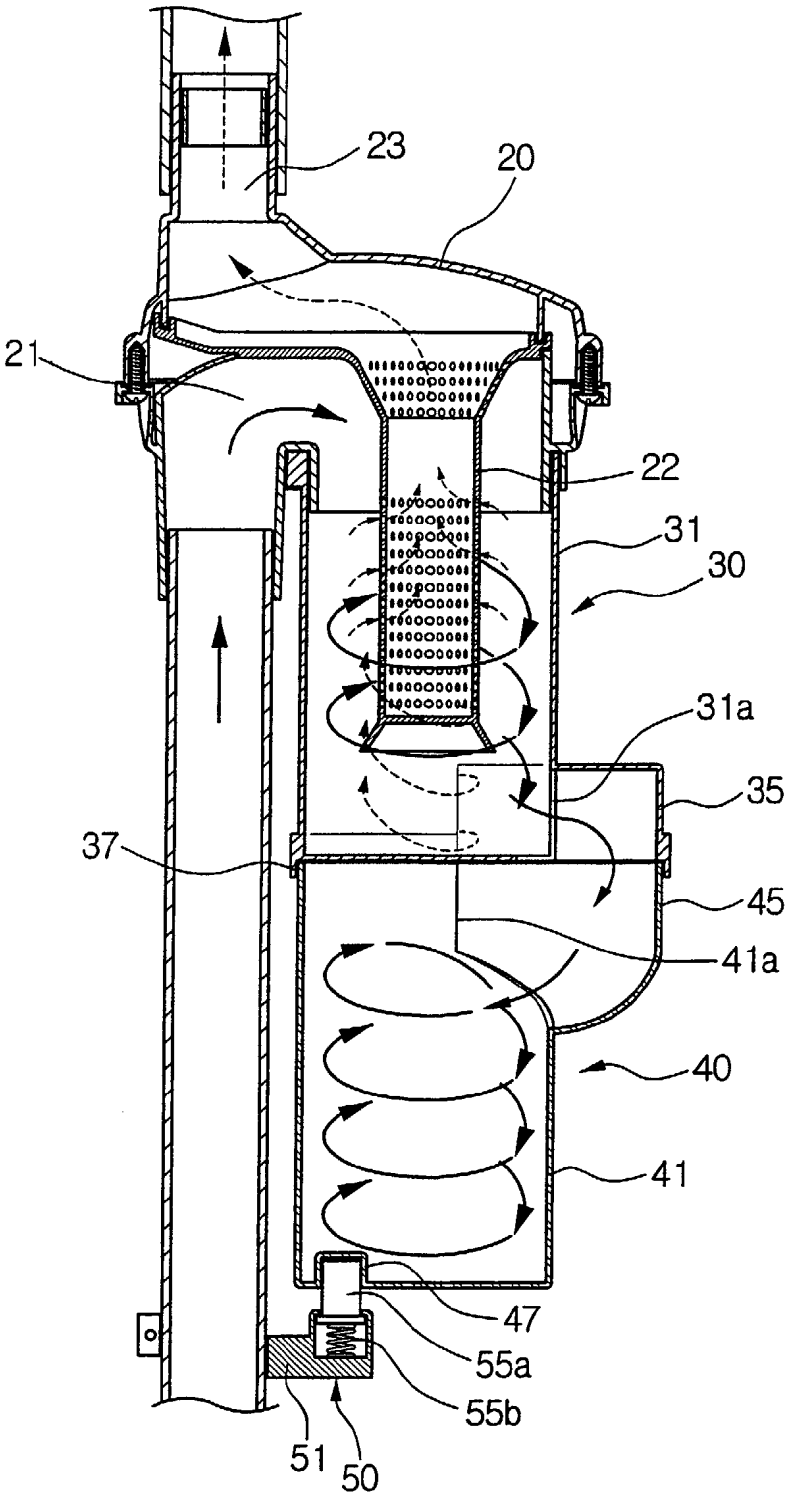
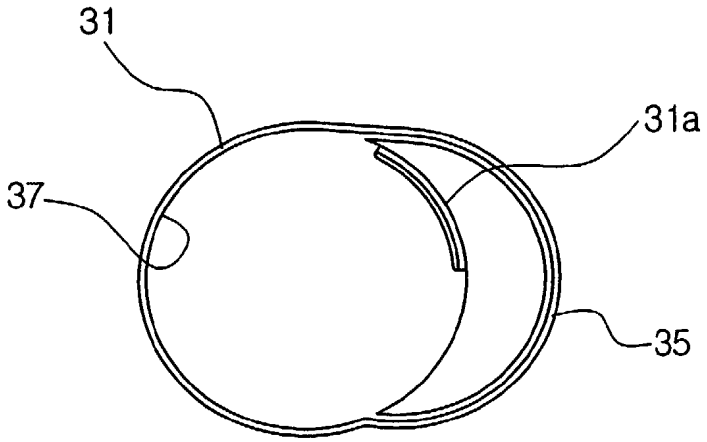


FIG.4



Cyclone dust collecting apparatus for a vacuum cleaner

The present invention relates to a vacuum cleaner, and more particularly, to cyclone dust collecting apparatus mounted in a telescopic extension pipe of the vacuum cleaner for collecting large particle contaminants from the air that is drawn into the vacuum cleaner.

Generally, cyclone dust collecting apparatus uses centrifugal force to separate particles from a fluid, such as air. Such apparatus is widely used in the field because of its simple structure and resistance to high temperatures and pressures. The apparatus collects large particles of contaminants, such as pieces of tissue paper, vinyl scraps or hairs from sucked air, thereby preventing the large particles of contaminants from entering into a paper vacuum cleaner bag, with the result that the life span of the paper bag is prolonged.

Figure 1 shows a vacuum cleaner with conventional dust collecting apparatus.

Referring to Figure 1, the cleaner includes a suction brush 4, a telescopic extension pipe 3 and a flexible hose 2. The telescopic extension pipe 3 and the flexible hose 2 connect the suction brush or suction head 4 to a cleaner body 1. The cleaner further includes a paper vacuum cleaner bag 7 for collecting contaminants, a motor (not shown) for generating a suction force, and cyclone dust collecting apparatus 10 for collecting large particles of contaminants. The cyclone dust collecting apparatus 10 is mounted on one end of the telescopic extension pipe 3.

The vacuum cleaner described above draws air and contaminants through the suction brush 4 and guides them diagonally to a cyclone cover 12, where they are induced into a vortex and the large particles of contaminants are separated from the vortex of air by centrifugal force. The separated contaminants are collected in the cyclone cover 12. The clean air ascends from the bottom of the cyclone cover and is then discharged to the cyclone body 1 through the flexible hose 2.

When the cyclone dust collecting apparatus 10 is accidentally tilted or turned upside down, or when it is full of contaminants, contaminants in the cyclone cover 12 can return to and block a grille 11 of the apparatus, thereby diminishing its cleaning efficiency.

In addition, when the cyclone cover 12 is filled with contaminants, the cyclone cover 12 must be detached from the vacuum cleaner and its contents removed. Since the grille 11 is exposed to the environment when the cyclone cover 12 is removed, contaminants in the grille 11 can contaminate the environment. Furthermore, careless handling by a user can damage the exposed grille 11.

Accordingly, it is an object of the present invention to mitigate these difficulties.

According to a first aspect of the present invention cyclone dust collecting apparatus for a vacuum cleaner having a telescopic extension pipe comprises a cyclone body for inducing the air in the cyclone body into a vortex, a cyclone cover coupled to the cyclone body for separating by the centrifugal force of the vortex the contaminants from the air, and a dust receptacle for collecting the separated contaminants. The cyclone cover has a cylindrical cover body, one end of which is closed. The cover body includes a first through-hole formed in a wall proximate the closed end and a first contaminants path in communication with the first through-hole. The dust receptacle includes a cylindrical collecting body having an open end and a closed end and a second contaminants path. The second contaminants path is formed on an outer wall of the open end of collecting body and communicates with the first contaminants path.

It is preferable that the first contaminants path has a greater width than the width of the first through-hole formed in a circumference of the cover body.

Also, it is preferable that the apparatus further includes a supporting unit fixed to the telescopic extension pipe and that a recess is formed in the closed end of the dust receptacle. The supporting unit engages the recess to support the dust receptacle and

secure the dust receptacle to the cyclone cover. In this case, the supporting unit may comprise a fixing member mounted to the telescopic extension pipe, and a protrusion which extends from one end of the fixing member and is inserted into the recess.

According to another aspect of the invention, a vacuum cleaner comprises a cleaner body, a suction brush coupled to the cleaner body via a telescopic extension pipe and a flexible hose; and a cyclone dust collecting apparatus mounted to the telescopic extension pipe including a cyclone body for inducing air and contaminants into a vortex; a cyclone cover coupled to the cyclone body, the cyclone cover including a cylindrical cover body and a first contaminants path, the cover body having an open end and a closed end and a first through-hole formed in a wall of the cover body proximate the closed end, the first contaminants path communicating with the first through-hole; and a dust receptacle removably coupled to the cyclone cover, the dust receptacle including a cylindrical collecting body having an open end and a closed end, and a second contaminants path in communication with the first contaminants path.

The cyclone dust collecting apparatus described in this specification provides a vacuum cleaner having a consistently high dust collecting efficiency, substantially regardless of the cleaning position of the cleaner. The chance of damage to the grille and contamination of the environment when contaminants are removed from the apparatus is much reduced.

The invention will now be described by way of example with drawings, in which:

Figure 1 is a perspective view of a vacuum cleaner having a conventional cyclone dust collecting apparatus;

Figure 2 is an exploded perspective view of cyclone dust collecting apparatus in accordance with the present invention, shown mounted to the extension pipe of a vacuum cleaner;

Figure 3 is a cross-section of the apparatus of Figure 2 in an assembled state; and

Figure 4 is a top view of a cyclone cover forming part of the apparatus of Figure 2.

Referring to Figures 2 and 3, cyclone dust collecting apparatus in accordance with the invention has a cyclone body 20, a cyclone cover 30, a dust receptacle 40, and a supporting unit 50 for supporting the dust receptacle 40. The cyclone body 20, which is mounted on a telescopic extension pipe 3 of the vacuum cleaner, includes an air inlet channel 21, a grille 22, and an air discharge channel 23. The air inlet channel 21 draws the air that is sucked in through the suction brush of the cleaner diagonally into the cyclone body. The grille 22 filters the air in the apparatus, and the air discharge channel 23 directs the filtered air from the grille 22 to the cleaner body of the cleaner.

The cyclone cover 30 has a hollow cylindrical cover body 31 for inducing the air that is drawn in through the air inlet channel 21 into a vortex, and a first contaminants path 35. The first contaminants path 35 guides the air and contaminants to the dust receptacle 40. An upper end of the cover body 31 is open, while a lower end is closed. Air is discharged from the cover body 31 through the grille 22 which is located axially inside the upper part of the cover body. A plurality of joint protrusions are formed at the upper end of the cover body 31 for connecting the cover body 31 to the cyclone body 20. A rectangular through-hole 31a is formed in the cylindrical wall of the cover body 31 and extends upward from the lower end a predetermined height.

The first contaminants path 35 is elbow-shaped. One end of the first contaminants path 35 is attached to the cover body 31 and substantially surrounds the first through-hole 31a, while the other end is open (refer to Figures 2 and 3). As shown in Figure 4, a cross-section of the first contaminants path 35 is an arc which has a radius of curvature substantially similar to that of the cover body 31. One end of the arc meets the outer wall of the body 31 tangentially adjacent one end of the first through-hole 31a, while the other end meets the outer wall of the cyclone body 31 away from the first through-hole 31a, the arc of the first contaminants path having a radius of curvature identical to that of the cyclone body 31.

Although the maximum length that the first-through-hole 31a can extend along the outer wall of the cover body 31 is the length between the two contact points of the cover body 31 and the first contaminants path 35, it is preferable that the length of first through-hole 31a is one-half of the maximum length. That is, if the diameter of the cover body 31 is 80 cm, the length of the outer wall of the cover body 31 between the points of intersection with the first contaminants path 35 is approximately 120 cm. Accordingly, the length of the first through-hole 31a is preferably 60 cm. The length of the first through-hole 31a can be adjusted further according to the size of the cover body 31 and volume of the contaminants discharged through the first through-hole 31a.

The lower end of the cover body 31 and the open end of the first contaminants path 35 are formed stepped for connection to the dust receptacle 40.

The dust receptacle 40 collects contaminants discharged through the first contaminants path 35. The dust receptacle 40 has a cylindrical collecting body 41 and a second contaminants path 45, which is securely connected to the open end of the first contaminants path 35.

The collecting body 41 has an open upper end, in which a second through-hole 41a is formed, while a closed lower end has a recess 47 formed on a lower surface thereof.

The cross-section of the second contaminants path 45 is shaped identically to that of the first contaminants path 35, and is of adequate size to be securely joined with the first contaminants path 35 to prevent any leakage of air from the cyclone dust collecting apparatus.

As shown in Figures 2 and 3, a contacting portion of an outer wall of the collecting body 41 with the second contaminants path 45 defines the second through-hole 41a. The second through-hole 41a extends from the contacting portion with a consistently increasing ratio to an open upper end of the second contaminants path 45 (refer to Figure 2), to guide contaminants discharged through the first contaminants path 35 to the collecting body 41.

The recess 47 that is formed in the lower surface of the closed end of the collecting body 41 is of a size corresponding to that of a protrusion 55 of a supporting unit 50. The recess 47 receives the protrusion 55 to secure the dust receptacle 40 to the telescopic extension pipe 3.

The supporting unit 50 includes a fixing member 51 that is mounted to the telescopic extension pipe 3. As mentioned above, the protrusion 55 is inserted into the recess 47 of the collecting body 41 to secure the dust receptacle 40 to the telescopic extension pipe. A circular clamp of a size corresponding to the outer circumference of the telescopic extension pipe 3 is formed on one end of the fixing member 51, and fixed to the telescopic extension pipe 3. The protrusion 55 is formed on the other end of the fixing member 51.

The protrusion 55 has a protrusion pin 55a, which is inserted into the recess 47 of the collecting body 41, and a spring 55b for resiliently supporting the protrusion pin 55a. The size of the protrusion pin 55a is determined in such a manner that the dust receptacle 40 can be detached from the cyclone cover 30 when a user manually pushes down on the dust receptacle 40. During normal cleaning operation of the vacuum cleaner, the spring 55b biases the protrusion pin 55a upward into engagement with the recess 47 of the collecting body 41, so that the dust receptacle will not detach from the cyclone cover 30 during the cleaning process.

Operation of the cyclone dust collecting apparatus will now be described in detail with reference to the attached drawings.

First, air and contaminants are drawn in through the suction brush 4 and into the air intake channel 21 of the dust collecting apparatus. The air intake channel 21 induces the air and contaminants into a vortex in the cyclone cover 30. The vortex has a centrifugal force, which separates large particles of contaminants from the air, and the large particles of contaminants descend in the cyclone cover 30. Next, the clean air

ascends from the bottom of the cyclone cover 30 and is discharged through the grille 22, the air discharge channel 23, and into the cleaner body.

Meanwhile, the descending contaminants that have been separated from the vortex of air are discharged through the first through-hole 31a, the first contaminants path 35, the second contaminants path 45, and into the dust receptacle 35. Since the lower end of the cover body 31 is closed, the contaminants continue to spin inside the dust receptacle 40 due to the vortex flow.

The cyclone cover 30 in cooperation with the cyclone body 21 induce the air and contaminants into a vortex in the cyclone body 21 to separate large particles of contaminants from the air by centrifugal force. The first and second contaminants paths 35 and 45 guide the separated contaminants to the dust receptacle 40, where the contaminants are collected.

To empty the dust receptacle 40 when it is full, the user manually pushes down on the dust receptacle 40 to depress the protrusion 55 of the supporting unit 50, thereby compressing the spring 55b and disengaging the dust receptacle 40 from the cyclone cover 30. After tipping the contaminants out of the dust receptacle 40, the user reinserts the protrusion pin 55a into the recess 47, pushes the dust receptacle 40 downward, repositions the upper end of the dust receptacle 40 with respect to the cyclone cover 30, and releases the dust receptacle 40. The dust receptacle 40 is then reconnected with the cyclone cover 30 and supported by the protrusion 55.

CLAIMS

1. Cyclone dust collecting apparatus for a vacuum cleaner having a telescopic extension pipe, the apparatus comprising:

a cyclone body arranged to be mounted on the telescopic extension pipe of the vacuum cleaner and arranged to induce air and contaminants into a vortex;

a cyclone cover coupled to the cyclone body for separating contaminants from the air by centrifugal force, the cyclone cover including a cylindrical cover body and a first contaminants path, the cylindrical cover body having an open end and a closed end and a first through-hole formed in a wall of the cover body proximate the closed end, the first contaminants path communicating with the first through-hole; and

a dust receptacle in communication with the first through-hole, the dust receptacle including a cylindrical collecting body having an open end and a closed end, and a second contaminants path formed on an outer wall of the open end, the second contaminants path corresponding to the first contaminants path.

2. Apparatus according to claim 1, wherein the first contaminants path is longer than the length of the first through-hole formed in its wall of the cover body.

3. Apparatus according to claim 1 or claim 2, wherein the dust receptacle has a recess formed in its closed end.

4. Apparatus according to any preceding claim further comprising a supporting device arranged to be separately mounted to the telescopic extension pipe.

5. Apparatus according to claim 4, wherein the supporting device comprises:

a fixing member for mounting on the telescopic extension pipe; and

a projection extending from an end of the fixing member and arranged to be received by the recess of the dust receptacle to secure the dust receptacle to the telescopic extension pipe.

6. A vacuum cleaner comprising a cleaner body, a suction brush, a telescopic extension pipe and a flexible hose for coupling the suction brush to the cleaner body, and cyclone dust collecting apparatus mounted to the telescopic extension pipe, wherein the dust collecting apparatus includes:

a cyclone body for inducing air and contaminants into a vortex;

a cyclone cover coupled to the cyclone body, the cyclone cover including a cylindrical cover body and a first contaminants path, the cover body having an open end and a closed end and a first through-hole formed in a wall of the cover body proximate the closed end, the first contaminants path communicating with the first through-hole; and

a dust receptacle removably coupled to the cyclone cover, the dust receptacle including a cylindrical collecting body having an open end and a closed end, and a second contaminants path in communication with the first contaminants path.

7. A vacuum cleaner according to claim 6, wherein the first contaminants path is longer than a length of the first through-hole formed in the wall of the cover body.

8. A vacuum cleaner according to claim 6 or claim 7, wherein the dust collecting apparatus further includes a support device mounted to the telescopic extension pipe, the support device supporting the dust receptacle in connection with the cyclone cover.

9. A vacuum cleaner according to claim 8, wherein a recess is formed in the closed end of the dust receptacle, and wherein the support device includes a pin and a spring, the spring biasing the pin into engagement with the recess to support the dust receptacle and to secure the dust receptacle to the cyclone cover.

10. A vacuum cleaner having a cleaner body with a suction motor, a cleaning wand with a suction head, an extension pipe and a flexible hose, the hose being coupled to the cleaner body, and a cyclone dust collector mounted to the extension pipe, wherein the dust collector comprises an air inlet passage, a generally cylindrical cyclone container enclosing a cyclone chamber, an air outlet passage, and a dust receptacle. The air inlet and outlet passages providing communication between the cyclone chamber

and the suction head and the cleaner body respectively, and wherein the cyclone container has an end wall spaced from the inlet passage, a circumferential opening in a side wall of the container adjacent the end wall, a shroud extending generally circumferentially over the said opening to define a contaminants collection passage, the dust receptacle being removably coupled to the cyclone container such that the interior thereof is in communication with the collection passage, whereby contaminants separated from incoming air in the cyclone chamber follow a contaminants path extending from the circumferential opening, through the collection passage and into the dust receptacle.

11. A cleaner according to claim 10, wherein the collection passage and dust receptacle are so configured that the contaminants path has a first, generally radial, part and a second, a downstream, part directed generally parallel to the axis of the cyclone container.

12. Cyclone dust collecting apparatus constructed and arranged substantially as herein described and shown in Figures 2 to 4 of the drawings.

13. A vacuum cleaner constructed and arranged substantially as herein described with reference to Figures 2 to 4 of the drawings.

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Application No: GB 0115873.2 **Examiner:** Kathryn Orme
Claims searched: 1-13 **Date of search:** 20 August 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4F (FSCA, FFD, FSCH)

Int Cl (Ed.7): A47L 9/16, 9/20, 9/24

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2344278	(SAMSUNG)	
A	EP 0827710 A2	(AB ELECTROLUX)	
A, P	WO 01/05291	(SHARP KK) see abstract and figs 1,2,3 and 9	
A	WO 00/49933	(LG ELECTRONICS) see especially figs 4, 5 and 8	
X	WO 00/49932	(LG ELECTRONICS) see page 4 lines 16-26, page 5 and figs 1, 3 and 8	X=10&11
X	WO 99/59458	(SEB S.A.) see abstract and figs 2a, 2d, 3 and 7a	X=10&11
X	US 5350432	(GOLDSTAR CO) see col 2 lines 51-68, col 3 lines 1-41 and figures 1,2,3 and 4	X=10&11

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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